PRODUCT DEVELOPMENT FOR PLAY THERAPY: STIMULATING CHILDREN WITH LEARNING DISABILITIES THROUGH THE USE OF THEIR OWN SENSES

Y. OLIVIER, R.W. DE LANGE AND J.J. REYNEKE

ABSTRACT

Various, multidisciplinary approaches can be used for the treatment of children with learning disabilities (LD). A multidisciplinary approach can include play therapy, remedial therapy, physiotherapy as well as a stimulant medication.

The aim of this study was to determine whether there is a difference between children with LD and children without LD in terms of differential-sensitivity. Twenty children that have been diagnosed with LD and twenty children without LD participated in and completed a range of actions such as interacting with a number of objects of different colours, sound stimuli, smell stimuli and a two-touch stimulus. The study found that children with LD have more difficulty in identifying their senses and its functions than children without LD. It could thus be possible that if sensory stimulants were integrated into play therapy mediums, that the unidentified child with LD could be identified earlier in that child's life.

Keywords: play therapy, learning disabilities, developmental toys

1. INTRODUCTION

Children that are categorized under the Emotional, Behavioural and Learning Disabilities (EBLD) group need a variety of stimulating material. Alternative approaches are suggested for the treatment of children with Attention Deficit Hyperactivity Disorder (ADHD) and a concomitant mathematics disability (Grizenko *et al.* 2006). Semrud-Clikeman (2005) is also of the opinion that a multitier approach to intervention in cases of children with Learning Disabilities (LD) has much promise. Parr *et al.* (2003) (with reference to Lord and Paisley [2000] and Hill and Taylor [2001]) as well as White and Rouge (2002) (with reference to Bunker [1996]), stated that a multidisciplinary approach to the management of ADHD is to be recommended of which a stimulant medication is an integral part. A multid isciplinary approach may involve therapeutic treatment such as play therapy, remedial therapy, physiotherapy and occupational therapy, and a stimulant medication such as Ritalin®, Concerta® or Strattera®. Complimentary therapies have become more popular as it has been introduced into several professions such as nursing.

Several authors have researched the effects of aromatherapy on mood and electroencephalogram (EEG) patterns and found that certain aromas can positively influence mood (Diego *et al.* 1998; Moss *et al.* 2003; Rawlings & Meerabeau 2003; Maddocks-Jennings & Wilkinson 2004).

O'Neill and Chong (2001), whose study included forty children and titled "Preschool children's difficulty understanding the types of information obtained through the five senses" and Weinberger and Bushnell (1994), whose study included twenty-eight children and titled "Young children's knowledge about their senses: Perceptions and misconceptions", found that children have no difficulty pairing each of the five sensory organs with its associated sensory action. Weinberger and Bushnell's (1994) study suggested that even if children can identify relevant sensory organs, they might not understand their functions. Of the five senses, sight is the most commonly used source of information for obtaining knowledge about an environment or object. Dunn and Bennet (2002), whose study included one hundred and forty children diagnosed with ADHD, found that the *Sensory Profile Test* may be a useful tool for confirming central features of the diagnosis in children that have been diagnosed with ADHD. Growing evidence suggests that children with ADHD differ from other children concerning sensory processing. It was also found that abnormal sensory responses were not specific to autism; however, overall sensory scores correlated with the severity of autism symptoms and IQ (Rogers *et al.* 2003). It was also found that the level of the severity of sensory symptoms was unrelated to overall retardation of a child. Several authors identified the importance of early intervention. This is an important condition of treatment effectiveness for children that are categorised under the EBLD group (Lopes 2005; Storch & Floyd 2005).

2. HYPOTHESIS

The findings referred to above show that children are able to distinguish between their different senses and are differential-sensitive to different textures. It is hypothesised that there will be a difference between children with LD and children without LD concerning their ability to distinguish between their different senses and their differential-sensitivity to different textures.

3. THE AIM OF THIS STUDY

The aim of this study is to determine whether there is a difference between children with LD and children without LD in terms of their ability to distinguish between their different senses and their differential-sensitivity concerning different textures. Children will be tested to verify the findings of O'Neill and Chong (2001) and Weinberger and Bushnell (1994), i.e. that children can distinguish between their different senses, and to verify the findings of Cook and Odom (1992) and Cook (1978), i.e. that children are differential-sensitive to different textures.

Early intervention is the key to a better future for children with EBLD/ADHD. If a disability is identified early in a child's life, that child can receive help at a crucial age. Mostly a latent disability or disabilities are only identified once a child enters primary school level. It is envisaged that if sensory stimulants were integrated into play therapy mediums, the unidentified child with LD could be identified earlier in that child's life. This in its turn will make early intervention possible.

4. BACKGROUND

4.1 The Different Senses

The results of Cook and Sprague (1995) titled "Feeling the parts: A developmental study of separable perception with tactile dimensions", were consistent with those of Garner's (1970) distinction between integral and separable stimuli. Garner (1970) found that some stimulus characteristics are perceived as "separable structure", whereas other stimulus characteristics such as saturation and brightness are perceived as "integral structure". Cook and Sprague's (1995) study found that children of different ages perceived and processed these tactile dimensions separately. The children were consistent in grouping stimuli that were identical on single dimensions, and showed individual differences in choice of dimensions. This study supported the differential-sensitivity view of Cook and Odom (1992) and Odom (1978). Odom (1978) and his colleagues' view of differential-sensitivity was that the perceptual system of the human body is differential sensitive to the various sources of incoming information and patterns. This is based on the perception of separable dimensions or relations of information.

Several studies concluded that music can be useful as a therapeutic medium (Kemper & Danhauer 2005; Kennelly & Brien-Elliot 2001). A selection of music, specially selected for therapeutic use, can reduce stress and enhance comfort and relaxation (Kemper & Danhauer 2005), but this depends on its ability to reach those individuals regardless of any ability (Kennelly & Brien-Elliot 2001).

The human body's perceptual system is developed to be differential sensitive. This allows humans to be able to distinguish between different textures and patterns.

4.2 Play therapy and developmental toys

It was found in different studies that if a child suffers an early traumatic experience, it may influence the normal development process of that child (Barrows & Bristol 2004; Pozzi 2000). Barrows and Bristol (2004) undertook a case study on an autistic child. Through play therapy a non-verbal, no eye contact and hand-gestured, the child who was hard to understand transformed over a three-year period of intensive therapy into a talkative, responsive child and the hand gesturing disappeared. In this study it was found that sibling rivalry plays an important role in a child's life. This autistic child had a sister (three years older) and a younger baby brother. The therapist commented during a play session that every object was experienced by the autistic child as a rival baby, who has the right to everything of which the autistic child was deprived of. Jackson (2004) worked with a five-year-old, multi-traumatised girl. He considered the importance of play, not only for symbolic communication, but also as a medium through which new experiences can be forged into reality. He described the therapeutic space being containment and exploration. Jackson also identified play as the key

that unlocks a child's ability to relive, share and understand some of the memories and experiences in that child's life. Malone and Langone (1999) found that if the efficacy of play-based assessment and programme development is enhanced, it can help young children with developmental concerns. Leblanc and Ritchie (2001) found that play therapy and non-play therapies were equally effective in the treatment of children with emotional difficulties. Their study found that the most important elements for initiating change in children are non-specific factors of the therapeutic relationship. Barrows and Bristol (2004) are of the same opinion as Leblanc and Ritchie. Barrows and Bristol, nonetheless, are of the opinion that a therapist that is more active in a playful way of working does seem to be helpful.

The role of parents' involvement and influence play an important role in a child's life. In a study by Goldbart and Mukherjee (2000) it was found that the child's cognitive impairment affects the time that a parent will expect a child to study rather than letting him or her play. Play is an important tool for the enhancement of skills development in children, but only if the child's play skill is facilitated (Rodger & Ziviani 1999). Wikström (2005) found in his study titled "Communicating via expressive arts: The natural medium of self-expression for hospitalised children" that children can shape their own world and needs through expressive arts and that they found satisfaction in these arts. Another important finding was that children were able to express their moods and feelings through expressive arts, a finding supported by Carrol (2002). Through play, children can learn problem-solving, appropriate social skills, organisation, planning and attain self-esteem (Burdette & Whitaker 2005). A therapist will use play material of various categories to stimulate children and by that to entering their world (Schoeman & Van der Merwe 1996). Nilsson (2000) found that a doll's house can act as an instrument that enables the expression and understanding of what is happening in a child's world. LEGO™ was found by LeGoff (2004) to be a therapeutic medium for the improvement of social competence in children with autistic spectrum disorders. LEGO™ lends itself to intervention strategies and the interest in playing with them improves the willingness of children to engage in therapeutic activities.

Tamm and Skär (2000) researched the roles and the relation in the play situations of children with restricted mobility. Results of their study indicated that children with restricted mobility played alone or with adults mostly. This indicated that these children do not have an expectation of experiencing a change in their lives. Prellwitz and Tamm (1999) researched the accessibility of playgrounds in Northern Sweden. It was found that the creators of the playgrounds had not sufficiently taken into account the accessibility of these playgrounds regarding children with restricted mobility and had deprived those children of their rights because to children playgrounds are an important outdoor environment. Burdette and Whitak er's (2005) primary conclusion was that children may need active and unstructured outdoor play to develop attention, affiliation and affection.

A need was identified for the therapist to be aware of the child's ethnic background and the therapist must take it into account to enhance those

specific therapeutic relationships (Jones 2002; Kranz *et al.* 2003; Ramirez *et al.* 2004). Jones (2002) is also of the opinion that by choice a child's therapist must be from the same ethnic group as the child.

Play therapy is not only to be used for symbolic communication, but also as a medium through which new experiences can be forged into reality. Developmental toys, within a play situation, can act as an instrument that creates an understanding of what is happening in a child's inner world.

4.3 ADHD and Ritalin

Children diagnosed with ADHD are mostly treated with methylphenidate (MPH) of which Ritalin® is the most common stimulant medication that is prescribed. In a recent study by Grizenko *et al.* (2006), the efficacy of MPH on children with ADHD and LD was investigated. Ninety-five participants were studied which included eighty-one boys and fourteen girls between the ages of six and twelve years. This study showed a decreased efficacy of MPH in children with ADHD and a learning disability (particularly in mathematics) and it is envisaged that these findings will stimulate investigation into alternative approaches to ADHD. Methodological issues in the assessment of medication effects in children with ADHD were investigated by Kollins (2004). A methodological issue that must be taken into account is the rate of absorption and distribution of a drug and its impact on behaviour. Ritalin® is taken orally, which makes it a safe drug and absorption and distribution occur more slowly. This drug, a schedule II medication, can however easily be abused by trading, selling or by offering it to others (Kirkpatrick 2005). Frankenberger and Cannon (1999) researched the effects of Ritalin® on academic achievement in twenty-six children from first to fifth grade. They found that performance declined from second to fifth grade on the verbal and nonverbal section of the participants' cognitive abilities. Pozzi (2000) is of the opinion that children below the age of six must not be given stimulant medication but rather engage in family therapy. Widener (1998) and several other authors shared Pozzi's view for therapeutic work between parents and children (Leblanc & Ritchie 2001; Ray *et al* 2000; Malone & Langone 1999; Storch& Floyd 2005; Arad 2004).

The use of methylphenidate on children with ADHD is not effective in all cases. The authors referred to above were of different opinions regarding stimulant medication. The findings discussed above identified the problem areas of children with LD and a mathematical disability. Grizenko *et al.* (2006) found that the effect of stimulant medications declines when administered to children who display LD and a mathematical disability.

4.4 Aromatherapy and massage

Research was done on the relation between aromatherapy and massage. A study by Dunn *et al.* (1995) suggested that the effects of a massage may be enhanced when 1% lavender oil is added to massage oils and creams. A randomised controlled trial of aromatherapy massage in a hospice setting was done with forty-five cancer patients. There was some evidence that

patients with cancer may experience significantly less pain immediately following a massage. This study showed the beneficial effect of massage on sleep quality and depression. The authors of the above-mentioned study were however unable to demonstrate any improvement in overall quality of life with a course of aromatherapy and/or massage. Buckle (2003) reported the benefits of these therapies for children with special needs. Her findings also suggested that massage can promote bonding between parent and child as well as the encouragement of tactile development, improved sleep patterns, increased production of endorphins and improved pain relief. Research studies from different authors investigated the aromas of rosemary and lavender essential oils. In a study by Diego *et al.* (1998) titled "Aromatherapy positively affects mood, EEG patterns of alertness and math computations" with forty participants which included thirty females and ten males, it was found that participants that were exposed to lavender were more relaxed, drowsiness was promoted and sleep and beta power increased. The lavender group did math equations equally as fast as the rosemary group but with improved accuracy. The rosemary group showed increased alertness and their alpha and beta power decreased. Similar findings were made by Moss *et al.* (2003). The findings of Moss *et al.* (2003) are in contrast with those of Diego *et al.* (1998). Moss *et al.* (2003) found no significant effects of lavender oil on the mood of the participants and also found that lavender and rosemary slowed down reaction times. The rosemary group experienced increased alertness and the lavender group experienced increased accuracy. In an EEG asymmetry responses study by Sanders *et al.* (2002), it was found that the lavender aroma has anti-depressant and/or anti-anxiety properties. These findings are supported by Maddocks-Jennings and Wilkinson (2004).

Aromatherapy can be used as an alternative treatment in the recovery area in cases of postoperative nausea and vomiting (Chiravalle & McCaffrey, 2005). In a study by Nicolaou and Johnston (2004), the benefits of complementary medicine were reported; the most commonly used was herbal medication.

All articles referred to above recommend the training of nurses in aromatherapy as a professional course. Children with special needs can benefit from massage. It may promote bonding, tactile development, improve sleep patterns, increase production of endorphins and improve pain relief.

5. STUDY METHOD

5.1 Participants

Forty participants participated in this study. Participants were divided into two groups; children with LD (twenty participants) and those without LD (twenty participants). Each group consisted out of five first, second, third and fourth year primary school children. All participants were recruited from two primary schools in Bloemfontein, South Africa. The children with LD were selected from a remedial class. Both schools were situated next to informal peri-urban settlements.

5.2 Materials

For each of the five senses investigated (sight, touch, hearing, smell and taste), an object (and corresponding test scenario) was carefully constructed and designed to meet the criteria of the property of the object (e.g. its scent) that could only be discovered through the use of one particular sensory means (e.g. smelling). The objects provided no other cues (e.g. colour) that could have acted as clue or permitted an inference as to its particular property. Only one test, being the first feel trial, required the children to perform intermediary action to determine the property of the object.

The five scenarios were as follows: (1) for the see trial a green and a red apple were used; (2) for the hear trial a bell and a rattle were used; (3) for the smell trial lemon-scented and coconut-scented clay were used; (4) for the first feel trial a piggy bank was used to determine weight; (5) for the second feel trial four blocks covered with different types of material (cotton, satin, velvet and netting) and a standard stimulus that was covered with velvet were used. The children had to determine, with their dominant hand, which of the four blocks were the same as the standard stimulus.

5.3 Procedure

5.3.1 Introduction

The children were individually tested in Bloemfontein. Those with LD were tested at a local clinic. The experiments were conducted by the occupational therapist from the clinic and the remedial teacher of the school. The group without LD was tested at their school. The experimenter was the remedial teacher of the school. The children were also tested in their home language by the experimenters. The experimenters sat at a small table in the playroom with the specific child that was tested at the time.

5.3.2 Pre-test Phase

In the pre-test phase the child was introduced to the various objects that were to be used in the testing. All the objects were shown and identified to each child. The experimenter made a statement such as "This is a red apple and this is a green apple".

The following objects were used for the pre-test phase: a red and green apple respectively were used for the see trial, a bell and rattle were used for the hear trial, lemon-scented and coconut-scented clay were used for the smell trial, a feather and a piggy bank were used for the first feel trial and four blocks covered with different textures (cotton, satin, velvet and netting) were used for the second feel trial. The children were also asked to name their different senses and the function of each (e.g. smell = nose). After the pre-test phase, the children were given pencils and a "colour me" picture which they had to colour in to determine their dominant hand for the second feel trial.

5.3.3 Test Phase

Only the objects to be used were left on the table in the playroom.

For the see trial one of the experimenters held the apple in her hand and asked: "What is the colour of the apple? Red or green?" The child then responded with what he/she thought was the correct answer. The experimenter then replied: "How did you know the apple was green/red?" The correct answer would have been: "I saw it". The experimenter then asked the final question for the trial being: "How did you see it?"/"With what did you see it?" The correct answer would have been: "With my eyes" or the child pointing towards his/her eyes.

For the hear trial one of the experimenters held the bell out of sight of the child and asked: "What sound did the toy make? A bell or a rattle sound?" The child then responded with what he/she thought was the correct answer. The experimenter then replied: "How did you know the toy made a bell/rattle sound?" The correct answer would have been: "I heard it". The experimenter then asked the final question for the trial being: "How did you hear it?"/"With what did you hear it?" The correct answer would have been: "With my ears" or the child pointing towards his/her ears.

For the smell trial one of the experimenters held out the scented clay and asked: "What flavour is the clay? Lemon or coconut?" The child then responded with what he/she thought was the correct answer. The experimenter then replied: "How did you know it was lemon/coconut flavour?" The correct answer would have been: "I smelled it". The experimenter then asked the final question for the trial being: "How did you smell it?"/"With what did you smell it?" The correct answer would have been: "With my nose" or the child pointing towards his/her nose.

For the first feel trial one of the experimenters handed the piggy bank to the child and asked: "Is the piggy bank heavy or light? The child responded then with what he/she thought was the correct answer. The experimenter then replied: "How did you know the piggy bank was heavy or light?" The correct answer would have been: "I felt it". The experimenter then asked the final question for the trial being: "How did you feel it?"/"With what did you feel it?" The correct answer would have been: "With my hands" or the child pointing towards his/her hands.

For the second feel trial one of the experimenters asked the child to close his or her eyes and took the child's dominant hand and touched the standard stimulus and guided his or her hand further with the question: "Which of the four objects best go with this one?" The child then responded with what he/she thought was the correct answer. The experimenter then replied: "How did you know that this one (being the one they chose) went best with the first one?" The correct answer would have been: "I felt it". The experimenter then asked the final question for the trial being: "How did you feel it?"/"With what

did you feel it?" The correct answer would have been: "With my hands" or the child pointing towards his/her hands.

6. RESULTS

The children with LD and without LD were compared through the use of Analysis of Variation (ANOVA) and followed up with *post-hoc* tests (Tukey's HSD and the LSD tests) to determine whether there was a significant difference between these two groups in the sensory activity, explanatory activity and the show activity. The results of the various tests and activities confirmed the hypothesis of this study that there is a difference between children with LD and children without LD regarding their ability to distinguish between their different senses and their differential-sensitivity to different textures. Compared to children with LD, the children without LD performed better in general in all the tests and activities.

6.1 Sensory Activity

The sensory activity required a correct verbal answer from the participants. ANOVA showed no difference between the groups for this activity.

Children with LD answered 67% of the sensory activity correctly compared to children without LD who answered 87% of the sensory activity correctly. A difference was found between the two groups in the smell trial and the second feel trial. Children with LD scored 35% (7/20) and 20% (4/20) respectively and children without LD scored 80% (16/20) and 55% (11/20) respectively. The group with LD had a very low correct response in the smell trial. In this trial the children had to establish what scent the clay had by smelling it. The results of the smell-trial can be ascribed to the fact that the children were not familiar with the scents, but children without LD from the same background could determine the correct scent. Both groups performed below expectations on the second feel trial. A factor that could have influenced the outcome of this trial could be that the children had to close their eyes for this trial. For the sensory activity, ANOVA and *post hoc* tests indicated that age, gender and grade (number of years at school) were not factors influencing the outcome of the activity. The results of this activity are given in Table I and Figure 1.

Table 1. Percentage of Correct Response in Sensory Activity

	See trial	**Hear trial**	**Smell trial**	**First feel trial**	**Second feel trial**
Children with LD	85	95	35	**100**	**20**
Children without LD	100	100	80	**100**	**55**

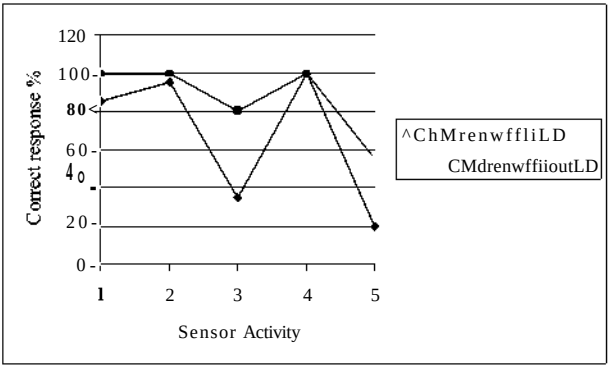

Figure 1. Percentage of Correct Response for each sensory activity (see, hear, smell and two feel trials)

6.2 Explanatory Activity

The explanatory activity required an explanation from the child stating how he or she determined the correct answer to the sensory activity. ANOVA showed a significant difference between the two groups of children ($p = 0.04$). Children with LD answered 73% of the explanatory activity correctly compared to children without LD who answered 92% of the explanatory activity correctly. A difference was found between the two groups in the hear trial. Children with LD scored 55% (11/20) and children without LD scored 100% (20/20). In this trial and activity the children had to answer how they heard the toy made a ringing sound. Children with LD mostly responded that they tasted it. It seems that children with LD can not make the connection that a sound, in this case the sound of a ringing bell, is heard. The first and second feel trial showed a difference, in the responses to the same questions in the group with LD. These questions were formulated exactly the same. Children with LD scored 90% (18/20) in the first feel trial and 75% (15/20) in the second feel trial. Children without LD scored 95% (19/20) in both feel trials. The difference between the answers in both feel trials can possibly be ascribed to low self-esteem, uncertainty and insecurity of children with LD. The results of the explanatory activity are given in Table 2 and Figure 2.

Table 2. Percentage of Correct Response in Explanatory Activity

	Sii trial	HiaT trial	Smell trial	First feel trial	Sic^nT" feel trial
Children with LD	70	55	75	90	75
Children without LD	70	100	100	95	95

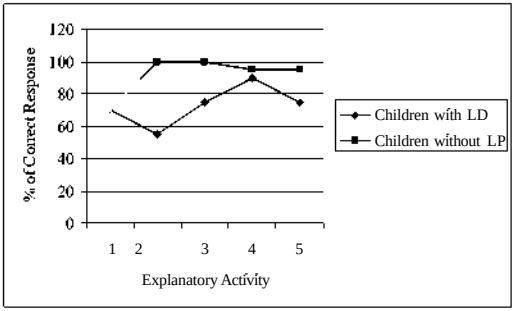

Figure. 2. Percentage of Correct Response for each explanatory activity (see, hear, smell and two feel trials).

6.3 Show Activity

The show activity required a gesture or an answer from the child stating with what sensory organ he determined the answer to the question asked as part of the explanatory activity. ANOVA showed no significant difference between the two groups of children with the show activities. Children with LD answered 85% of the show activity correctly compared to children without LD who answered 96% of the show activity correctly. In the trial questions no significant difference was found between the two groups. Similar findings were found in this activity and the explanatory activity for both feel trials. The first and second feel trial showed a difference between the same questions in the group with LD. These questions were formulated exactly the same. Children with LD scored 65% (13/20) in the first feel trial and 85% (17/20) in the second feel trial. Children without LD scored 95% (19/20) in both feel trials. ANOVA indicated that age ($p = 0.03$) and grade ($p = 0.01$) were factors in the show activity. The results of this activity are given in Table 3 and Figure 3.

Table 3. Percentage of Correct Response in Show Activity

	~Se^ trial	He^r trial	SrnelT trial	Fir^t feel trial	S^oTid" feel trial
Children with LD	95	90	90	65	85
Children without LD	90	100	100	95	95

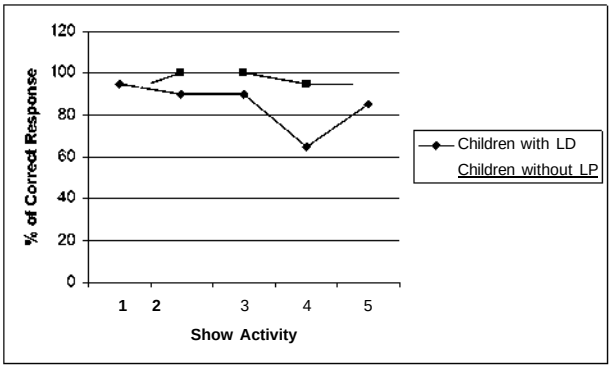

Figure 3. Percentage of Correct Response for each show activity (see, hear, smell and two feel trials)

6.4 Grade

Grade, here referring to the number of years at primary school, was a factor in correct response of the children in the different activities. ANOVAand *post hoc* tests concluded that grade was a factor in the explanatory and sensory activity (p = 0.01). The results of the correct response within these activities are concluded in Table 4 and Figure 4.

Table 4. Average of Correct Response in Explanatory and Sensory Activities with the number of years at primary school as a factor (%)

	"Fir^T year	Second year	Third year	Fourth year
Children with LD	"6^4~ 84	"64^	80^~	~9T6
Children without LD		94.67	94.67	93.33

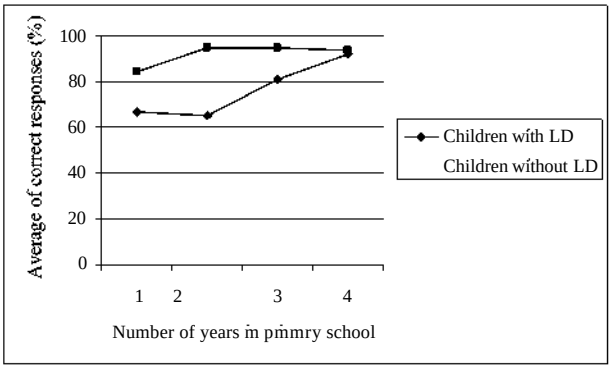

Figure 4. Average of Correct Response in Explanatory and Sensory Activities with the number of years at primary school as a factor (%)

7. DISCUSSION OF THE RESULTS AND CONCLUDING REMARKS

This study was undertaken to identify sensory differences between children with LD and children without LD. This study found that there is a significant difference between children with LD and children without LD in sensory and differential-sensitivity tests ($p = 0.02$). Overall children in the lower grades and of a young age with LD performed poorer in sensory and differential-sensitivity tests than children with LD in a higher grade and of an older age.

Sensory and differential-sensitive materials were incorporated into the testing of children with LD and children without LD. The testing consisted out of three activities: sensory, explanatory and show activities. These activities in turn consisted out of five sensory trials, namely see, hear, smell and two feel trials.

In the sensory activity it was found that there was no difference between the two groups as a whole. Age, gender and grade were not factors influencing the outcome of this activity. However, in the smell and second feel trial (differential-sensitivity trial), a significant difference was found between the two groups. Children with LD performed poorer than children without LD in the above mentioned trials in this activity.

In the explanatory activity a significant difference was found between the two groups ($p = 0.04$). In the trial questions, a significant difference was found in the hear trial. In this trial of the explanatory activity it was found that children with LD performed poorer than children without LD ($p = 0.04$). Overall males performed poorer than female children in both groups in this activity. It was most ly males with LD in Grade 1 to Grade 3 that had problems in the explanatory activity.

In the show activity no significant difference was noted between the two groups. Age ($p = 0.03$) and grade ($p = 0.01$) were however factors in this activity. In the trial questions, a significant difference was noted between children with LD and without LD in the first feel trial. Children with LD in the lower grades and who was of a younger age performed poorer than children with LD in a higher grade and of an older age. Children with LD performed poorer than children without LD. Children without LD had a higher percentage of correct response and grade and age were not factors in the percentage of correct response.

The results of this study is similar to the results of O'Neill and Chong (2001) and Weinberger and Bushnell (1994) that children without LD have no difficulty in pairing each of the five sensory organs with its associated sensory action. Overall children with LD scored lower than children without LD in the three different activities. The conclusion can be made that a child with LD has difficulty in pairing the sensory organs with its associated sensory action. Thus, if a child has difficulty in pairing the sensory organ to its action, it could be an indication of an underlying LD. This study is of the same opinion as Dunn and Bennet (2002) that children with LD, specifically ADHD, differ in sensory processing from other children. From Grade 1 to Grade 4 there was

an increase of correct response in children with LD. Children without LD from Grade 1 to Grade 4 had a similar rate of correct response.

This study does not draw the same conclusion as Cook and Odom (1992) and Cook (1978) that children without LD are differential-sensitive to different textures. Overall children with LD and without LD performed below expectations in the second feel trial that tested differential-sensitivity. Both groups of children could not distinguish between the different textures of the wooden blocks (cotton, satin, velvet and netting). LD did not play a role in the differential-sensitivity of these children. The childrens' poor socio-economic conditions could have played a role in the development of the ability to differentiate between different types of textures. If children with an underlying LD who have not been identified yet could be identified earlier in their lives, it could lead to early intervention. This is an important condition for the treatment effectiveness for children categorised under the EBLD group. Product development into which sensory stimulants are integrated can help with the identification of children with an underlying LD. These sensory products can be incorporated at pre-primary schools, clinics, pediatrician playrooms and playgrounds.

Further research is needed on the topic of this study with a larger number of participants. Possible research topics include studies on the differences between children from a high social/economic class and children from a low social/economic class and as in this study, on the differential sensitivity differences in these two groups. Another possible research topic can be the effects of the incorporation of sensory products in the identification of children with an underlying LD.

8. REFERENCES

Arad, D. (2004). If your mother were an animal, what animal would she be? Creating play-stories in family therapy: The Animal Attribution Story-Telling Technique (AASTT). *Family Process,* 43(2), 249-263.

Barrows, P. & Bristol, U.K. (2004). "Playful" therapy: Working with Autism and Trauma. *Int Forum Psychoanal,* 13, 175-186.

Buckle, S. (2003). Aromatherapy and massage: The evidence. *Pediatric Nursing,* 15(6), 24-27.

Burdette, H.L. & Whitaker, R.C. (2005). Free play. *The Nurse Practitioner,* 30(6), 56.

Bunker PC. (1996). Attention-deficit/hyp eractivity disorder: A diagnosis for the 90's. *Nurse Practitioner: American Journal of Primary Health Care,* 21, 43-52.

Carrol, J. (2002). Play therapy: The children's views. *Child & Family Social Work,* 7, 177-187.

Chiravalle, P. & McCaffrey, R. (2005). Alternative therapy applications for postoperative nausea and vomiting. *Holistic Nursing Practice,* 19(5), 207-210.

Cook, R.D. (1978). *A Perceptual salience account of Décalage Relations and Developmental Change, Alternatives to Piaget: Critical Essays on the theory* /.New York: Academic Press.

Cook, G.L. & Odom, R.D. (1992). Perception of multidimensional stimuli: A differential-sensitivity account of cognitive processing and development. *Journal of Experimental Child Psychology,* 54, 213-249.

Cook, G. & Sprague, R. (1995). Feeling the parts: A developmental study of separable perception with tactile dimensions. *Journal of General Psychology,* 122(2), 171-187.

Diego, M.A., Jones, N.A, Field, T, Hernandez-Reif, M., Schanberg, S., Kuhn, C, McAdam, V., Galamaga, R., & Galamaga, M. (1998). Aromatherapy positively affects mood, EEG patterns of alertness and math computations. *International Journal of Neuroscience,* 96, 217-234.

Dunn, C, Sleep, J., & Collett, D. (1995). Sensing an improvement: An experimental study to evaluate the use of aromatherapy, massage and period of rest in an intensive care unit. *Journal of Advanced Nursing,* 21, 34-40.

Dunn, W. & Bennet, D. (2002). Patterns of sensory processing in children with Attention Deficit Hyperactivity Disorder. *The Occupational Therapy Journal of Research,* 22(1), 4-15.

Frankenberger, W. & Cannon, C. (1999). Effects of Ritalin on academic achievement from first to fifth grade. *International Journal of Disability Development and Education,* 46(2), 199-221.

Garner, W.R. (1970). The stimulus in information processing. *The American psychologist,* 25, 350-358.

Goldbart, J. & Mukherjee, S. (2000). Play and toys in West Bengal: Self-reports of parents of children with cerebral palsy. *International Journal of Disability Development and Education,* 47(4), 337-353.

Grizenko, N., Bhat, M., Schwartz, G., Ter-Stepanian, M., Joober, R. (2006). Efficacy of methylphenidate in children with Attention Deficit Hyperactivity Disorder and learning disabilities: A randomized crossover trial. *Journal of Psychiatry & Neuroscience,* 31(1), 46-51.

Hill, P. & Taylor, E. (2001). An audit able product for treating Attention Deficit Hyperactivity Disorder. *Arch Dis Child,* 84, 404-409.

Jackson, E. (2004). Trauma revisited: A 5-year-old's journey from experiences, to thoughts, to words, towards hope. *Journal of Child Psychotherapy,* 30(1), 53-70.

Jones, A.M. (2002). An account of play therapy with an abused child from a different ethnic background to the therapist. *Children & Society,* 16, 195-205.

Kemper, K.J. & Danhauer, S.C. (2005). Music as therapy. *Southern Medical Association,* 98(3), 282-288.

Kennelly, J. & Brien-Elliot, K. (2001). The role of music therapy in pediatric rehabilitation. *Pediatric Rehabilitation,* 4(3), 137-143.

Kirkpatrick, L. (2005). ADHD treatment and medication: What do you need to know as an educator? *The Delta Kappa Gamma Bulletin,* Fall, 19-24.

Kollins, S.H. (2004). Methodological issues in the assessment of medication effects in children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). *Journal of Behavioural Education,* 13(4), 247-266.

Kranz, P.L.; Ramirez, S.Z.; Flores-Torres, L.L. (2003). Physical settings, materials and related Spanish terminology recommended for play therapy with first-generation Mexican-American children. *Education,* 126(1), 93-99.

Leblanc, M. & Ritchie, M. (2001). A meta-analysis of play therapy outcomes. *Counseling Psychology Quarterly,* 14(2), 149-163.

LeGoff, D.B. (2004). Use of LEGO© as a therapeutic medium for improving social competence. *Journal of Autism and Developmental Disorder,* 34(5), 557-571.

Lopes, J. (2005). Intervention with students with learning, emotional and behavioural disorders: Why do we take so long to do it? *Education and Treatment of Children,* 28(4), 345-360.

Lord, J. & Paisley, S. (2000). The clinical effectiveness and cost effectiveness of methylphenidate for hyperactivity in Childhood: Version 2. *National Institute for Clinical Excellence,* London.

Maddocks-Jennings, W. & Wilkinson, J. (2004). Aromatherapy practice in nursing: Literature Reviews. *Journal of Advanced Nursing,* 48(1), 93-103.

Malone, D.M. & Langone, J. (1999). Teaching object-related play skills to preschool children with developmental concerns. *International Journal of Disability Development and Education,* 46(3), 325-336.

Moss, M., Cook, J., Wesnes, K., & Duckett, P. (2003). Aromas of rosemary and lavender essential oils differentially affect cognition and mood in healthy adults. *International Journal of Neuroscience,* 113, 15-38.

Nicolaou, N. & Johnston, G.A. (2004). The use of complementary medicine by patients referred to a contact dermatitis clinic. *Contact Dermatitis,* 51, 30-33.

Nilsson, M. (2000). The dolls' house: Dream or reality? *Journal of Child Psychotherapy,* 26(1), 79-96.

O'Neill, D.K. & Chong, S.C.F. (2001). Preschool children's difficulty understanding the types of information obtained through the five senses. *Child Development,* 72(3), 803-815.

Parr, J.R., Ward, A., & Inman, S. (2003). Current practice in the management of Attention Deficit Disorder with Hyperactivity (ADHD). *Child: Care, Health & Development,* 29(3), 215-218.

Pozzi, M.E. (2000). Ritalin for whom? Understanding the need for Ritalin in psychodynamic counseling with families of under-5's. *Journal of Child Psychotherapy,* 26(1), 25-43.

Prellwitz, M. & Tamm, M. (1999). Attitudes of key persons to accessibility problems in playgrounds for children with restricted mobility: A study in a medium-sized municipality in Northern Sweden. *Scandinavian Journal of Occupational Therapy,* 6, 166-173.

Ramirez, S.Z.; Flores-Torres, L.L.; Kranz, PL.; Lund, N.L. (2004). Using Axline's eight principles of play therapy with Mexican-American children. *Journal of Instructional Psychology,* 32(4), 329-337.

Rawlings, F. & Meerabeau, L. (2003). Implementing aromatherapy in nursing and midwifery practice. *Journal of Clinical Nursing,* 12, 405-411.

Rodger, S. & Ziviani, J. (1999). Play-based occupational therapy. *International Journal of Disability Development and Education,* 46(3), 337-365.

Rogers, S.J., Hepburn, S., & Wehner, E. (2003). Parent reports of sensory symptoms in toddlers with autism and those with other developmental disorders. *Journal of Autism and Developmental Disorders,* 33(6), 631-642.

Sanders, C, Diego, M., Fernandez, M., Field, T., Hernandez-Reif, M., & Roca, A. (2002). EEC asymmetry responses to lavender and rosemary aromas in adults and infants. *International Journal of Neuroscience,* 112, 1305-1320.

Schoeman, J.P & Van der Merwe, M. (1996). *Entering the child's world: A play therapy approach.* Harmondsworth: Penguin.

Semrud-Clikeman, M. (2005). Neuropsychological aspects for evaluating learning disabilities. *Journal of Learning disabilities,* 38(6), 563-568.

Storch, E.A. & Floyd, E.M. (2005). Introduction: Innovative approaches to parent-child interaction therapy. *Education and Treatment of Children,* 28(2), 106-110.

Tamm, M. & Skär, L. (2000). How I play: Roles and relations in the play situations of children with restricted mobility. *Scandinavian Journal of Occupational Therapy, 7,* 174-182.

Weinberger, N. & Bushnell, E.W. (1994). Young children's knowledge about their senses: Perceptions and misconceptions. *Child Study Journal,* 24(3), 209-223.

White, H.L. & Rouge, B. (2002). Ritalin update for counselors, teachers, and parents. *Education,* 124(2), 289-296.

Widener, A.J. (1998). Beyond Ritalin: The importance of therapeutic work with parents and children diagnosed with ADD/ADHD. *Journal of Child Psychotherapy,* 24(2), 267-281.

Wikström, B. (2005). Communicating via expressive arts: The natural medium of self-expression for hospitalized children. *Pediatric Nursing,* 31(6), 480-485.